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ABSTRACT

The purpose of this investigation was to qualitatively study the transfer of skills and perceptions developed in microteaching to the student teaching experience. In addition, the study analyzed whether there was further development or changes of these skills and concerns throughout the duration of student teaching. The initial sample used was 17 preservice secondary science teachers enrolled in a microteaching course. A stratified random sample of six of these student teachers was followed into the immediate subsequent student teaching experience. Four rounds of qualitative analyses were used to assess the congruence among the concerns, perceptions, and decision-making skills identified upon the completion of the microteaching course and those first expressed upon first immersion into student teaching; and development and changes of the aforementioned perceptions, skills, and concerns during student teaching. Those concerns and perceptions evidenced during microteaching persisted during student teaching, along with a few additional concerns. Additionally, the perception of planning changed as the students began their practice teaching. Although the subjects completed the microteaching experience primarily with concerns for self, they exhibited an immediate dominance of concerns for students upon entering student teaching. (CW)

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Metamorphosis, Adaptation, or Evolution?: A Longitudinal Investigation of Preservice Science Teachers' Instructional Decisions, Concerns, and Perceptions

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Introduction

Research on "teachers' thinking" has flourished widely during the past decade and has provided much insight into how teachers plan for instruction and upon what bases instructional decisions are made (Berliner & Rosenshine, 1987; Clark & Peterson, 1986). Although the diversity of science teacher education programs continues to escalate, the microteaching course and student teaching experience continue to provide the primary focus for such programs (Yeany & Padilla, 1986). It is within these experiences that the preservice teacher is afforded the most systematic opportunity (and possibly the only opportunity) to practice the execution of instructional plans, develop instructional skills and behaviors, and receive "formal" feedback on pedagogical matters prior to certification and employment as a science teacher. Given the prominence of the microteaching course and student teaching experience within science teacher education programs, it is quite disconcerting that the related (i.e., transfer of effects from microteaching to the field) and combined effects of such experiences have been virtually ignored.

Although some prior research on preservice teachers' planning, concerns, and decision making has been pursued (Berliner & Rosenshine, 1987; Cronin, 1988; Evans & Tribble, 1986; Fuller, 1969; George, 1978; Gess-Newsome & Lederman,

in press; Reeves & Kaselkis, 1985; among others), such investigations have focused specifically upon either microteaching, student teachers, beginning teachers, or experienced teachers with no attention given to "long term" development or the transfer between campus and field based components of teacher education programs. Indeed, the absence and need for longitudinal studies which carefully investigate the total professional development (i.e., prior to student teaching and beyond) of the preservice/beginning teacher has been well documented (Clark & Peterson, 1986).

This investigation actually represents a continuation of a previous project which focused exclusively on a microteaching course. The purpose of the present investigation was to qualitatively study (so as to avoid any unsubstantiated a priori assumptions) 1) the transfer of skills and perceptions developed in microteaching to the student teaching experience, 2) any changes or further development of these (or any additional) skills and/or concerns throughout the duration of student teaching. It is believed that this longitudinal investigation (spanning campus-based and field-based experiences) will provide significant insights into the development of the preservice science teacher's instructional behaviors, concerns, perceptions of teaching, and decision making skills and will serve to further improve the quality of both the campus and field based components of science teacher education.

Design

Given the exploratory nature of this research, a qualitative approach was used for the collection and analysis of data. In particular, the case study design, as specified by Bogdan and Biklen (1982), was deemed to be most appropriate.

Subjects

A total of 17 preservice science teachers enrolled in a microteaching course constituted the initial sample for this longitudinal investigation. All of the students had previously completed a secondary science teaching methods course and the microteaching course represented the final professional education course to be taken prior to student teaching. Following the initial phase of this investigation, a stratified random sample of six of these preservice teachers was selected for a "follow-up" investigation during the immediately subsequent student teaching experience. Of the six student teachers (4 males, 2 females), five were completing undergraduate degrees leading to secondary science teacher certification while one was a graduate student pursuing initial certification.

Data Collection

This report will focus primarily upon the data collected during the student teaching experience and its relationship to the data collected (and previously analyzed) during the microteaching phase of this investigation. However, in an effort to provide the appropriate context, it

is important to briefly review the data collection procedures followed during the microteaching course.

Each student viewed and critiqued each of his/her four videotaped microteaching lessons. In addition, informal verbal feedback from peers and course instructors (immediately following the lesson) and a formal written critique from the course instructors were provided. Each student's attitudes, perceptions, and instructional decisions were further documented by an "open ended" questionnaire administered immediately preceding and following each presentation.

Those six individuals "followed" into student teaching were required to complete a similar questionnaire prior to the beginning of student teaching and following each of the 15 weeks of their field experience. Each week, these individuals were observed, videotaped, and provided with written and oral feedback in the same manner as provided during the microteaching course. This feedback and supervision was provided by the same individuals who conducted the microteaching course. In addition, these student teachers attended a special weekly seminar (in lieu of the seminar attended by other student teachers) in which their videotapes and concerns about teaching were systematically discussed by the group. All seminars were audiotaped for later analysis.

The questionnaires completed by the student teachers prior to, and during, their field experience consisted of the following eight "open-ended" items:

1. At this time, what specific teaching skills and/or techniques do you feel you are performing well? What evidence have you used to support this conclusion?
2. On which teaching skills/techniques do you need to improve? What evidence have you used to support this conclusion?
3. How do you plan to improve the items mentioned in question #2? Be specific. Did you develop these plans on your own? With the aid of your cooperating teacher? With the aid of your University supervisor? Others?
4. Have your previous plans to improve been successful? Why or why not?
5. What specific steps, in sequence, do you follow in preparation for teaching a lesson? A unit?
6. What specific skills/techniques that you learned and/or practiced in microteaching have helped you during student teaching? Which skills/techniques were irrelevant?
7. What teaching skills/techniques have been important for your success in student teaching, but were not addressed in microteaching?
8. Do you have additional comments or concerns?

Data Analysis

A systematic, intensive, qualitative analysis of subjects' questionnaire responses and seminar discussions was performed in an attempt to derive any evident patterns in subjects' attitudes, thinking, perceptions and/or instructional decisions. Similar analytic comparisons were made between the data collected during the student teaching experience and those data collected during the microteaching course in an effort to assess: 1) the congruence among the concerns, perceptions, and decision making skills identified upon the completion of the microteaching course and those expressed upon first "immersion" into student teaching, 2) the development and/or changes of the aforementioned perceptions, skills, and concerns during the student teaching experience.

A series of four "rounds" of qualitative analyses were performed by the researchers in accordance with the guidelines specified by Bogdan and Taylor (1975). This repetitive analytic process provided for the derivation and validation of a final list of 17 areas/categories of instructional concerns, perceptions, attitudes, etc. which were grouped under two major headings (i.e., concerns for self, concerns for students).

Results and Discussion

The qualitative analysis of data yielded a total of 17 categories of subjects' perceptions, concerns, etc., and

elucidated several discrepancies between field based and campus based perceptions of preservice teachers. Descriptive labels, operational definitions, and specific illustrative quotations which led to the derivation of each of the 17 categories of concerns are presented below.

Concerns for Self

1. Physical Appearance/Expression and Confidence: reference to physical appearance, mannerisms, or level of confidence

   "I feel that I have become more comfortable in front of the students. Part of this feeling is the realization that the students do not look at me as if I dress funny or look awkward."

2. Speech: reference to clarity, volume, rate, pacing, verbal tics, diction, and pronunciation associated with verbal discourse

   "I need to keep the stress level and tone of my voice constant, that is, 8th period I should be as enthusiastic and 'stress free' as 6th period."

3. Audio-Visual Mechanics: comments concerning the mechanical aspects of audio-visual use

   " My board work still needs improvement. I don't know why I do it, but I write smaller as I go to the right and as I work down the board."

4. Lesson Plan Access: the ease with which one can extract information from one's written plans

   "Seems no matter how neat and organized I make

my plans, I can't find where I'm at in my notes."

5. Clerical/Administrative Skills: logistics, procedures, and policies for the completion of paper work such as attendance, grade books, detentions, progress reports, etc.
   "I am lacking in the area of administration skills. Recently, I should have assigned a student to detention because of too many tardies, but I didn't realize how many the student had earned."
6. Work Load: recognition of the amount of time it takes to perform the complete or partial responsibilities of a classroom teacher
   "I feel like I've been overwhelmed and I am only teaching one class so far."
   "It's almost Thanksgiving! Oh my God!!! Three preps is exponentially more work than two."

Concerns for Students

7. Reactions to and Cognizance of Students: awareness/reactions to student behavior
   "I need to improve on my ability to scan the room and 'pick up' on students who are bored or restless."
8. Student Involvement: attention to student participation in the lesson
   "Having students participate in the lesson by

getting involved with lectures or assisting with demos worked well. Keeping the students involved often was really fun, surprised the kids, and helped them pay attention."

9. Instructional Sequencing: pertains to the interrelationships among segments of the lesson; coherency of lesson
   "My lessons have a coherent flow and are understandable by the students. Having a logical sequence of material really helps in directing and organizing my lessons."
10. Concrete and Relevant Instruction: stress is on making instruction meaningful to students
    "Having anecdotes and 'real-life' examples and concrete demonstrations is very important. I can see when I use these types of techniques the level of interest and learning improve greatly."
11. Use of Questioning: focus on instructional purpose and effectiveness of questioning
    "When a student asks a question, I am getting better at asking other questions so he answers his own question by applying logic, deduction, etc."
12. Management: focus on both classroom control and general logistics of classroom activities
    "I keep my back to the wall so I can look up

and see students at all times. Also, I am monitoring students' note taking better by walking out into the classroom."

13. Instructional Planning: attention to the pre-instructional phase of instruction
"I have been planning in all details and making no assumptions. For instance, surely they'll know not to use the rulers as weapons without my saying so - WRONG!"

14. Motivation: maintenance of student interest and willingness to cooperate/participate in learning activities
"Need to find some way to get students excited about wanting to learn a seemingly useless bunch of unrelated facts. It seems important to show how other chapters are related to what is being studied, but this difficult to do without getting off the track."

15. Rapport: relationship between the teacher and his/her students
"Getting along with students is pretty important. It's a lot easier to get them to work if they're on your side."

16. Depth and Breadth of Material: assessing the appropriate level and amount of subject matter to be presented

"I think that I am getting a better over all feel for what skills, processes, and content can be taught at this level. The days of over kill are less frequent."

17. Time Requirements for Learning: specific attention to the time requirements for effective presentation of activities and subsequent learning

"I am amazed at how long it actually takes to teach a lesson. I am also amazed at how much time it takes to just get some basic ideas across."

Most of these categories, in and of themselves, do not present an unexpected picture of the preservice teacher's beliefs and perceptions about teaching. Indeed, analogous concerns have previously been documented among samples of microteaching students, student teachers, beginning teachers, and experienced teachers (Clark & Yinger, 1979; Cronin, 1988; Evans & Tribble, 1986; Fuller, 1969; George, 1978; Gess-Newsome & Lederman, in press; Reeves & Kaselkis, 1985). However, the longitudinal nature of this investigation allowed the researchers to make direct comparisons between preservice teachers' perceptions, beliefs, etc. during campus based preparation (i.e., microteaching) with those possessed by the same individuals during student teaching. It is within this context of comparison that the aforementioned categories are given new

meaning and a variety of intriguing patterns/trends are elucidated.

At the most basic level, the number of areas of concern within each of the major divisions increased as the subjects became immersed in student teaching. In particular, Clerical/Administrative Skills and Work Load were added to "Concerns for Self." Given the obvious differences between campus preparation and student teaching, these additional areas of concern are easily explained. That is, the multitude of paper work and other clerical duties which are a "normal" component of the classroom teacher's responsibilities are not present (with the possible exception of lesson planning) within the context of a campus based microteaching course. In addition, as one assumes the planning, instructional, and administrative responsibilities of 3-5 classes, the Work Load is clearly more formidable than the planning and presentation of four independent microteaching lessons.

Within "Concerns for Students," four additional concerns were noted during the student teaching experience (i.e., Motivation, Rapport, Depth and Breadth of Material, and Time Requirements for Learning) while Audio-Visual Use was no longer a concern. The additional areas of concern are clearly critical to the enhancement of student learning and it can be argued that the preservice teacher is not sincerely attempting to enhance the learning of his/her

peers during a microteaching presentation. With respect to Rapport, the following was a typical comment:

> "One skill that is somewhat important is how well you get along with the students. Can you talk to them about things that they like to talk about? If you can, then they tend to be on your side when it's time to work."

It seems reasonable that a preservice teacher would not have such a concern for his/her peers in the context of four independent microteaching presentations. With the exception of Audio-Visual Use (i.e, effective use of audio-visual materials to enhance learning), all areas of concern expressed during the microteaching course were also areas of concern during student teaching. Given the variety of additional instructional concerns confronting the student teacher, it is not very surprising, for example, that the efficient instructional use of the overhead projector may become an overlooked skill.

There were some extremely intriguing discrepancies between the perceptions of planning during the microteaching course and those expressed during student teaching. Planning was consistently viewed as a two component process (i.e., the physical act of writing a lesson plan and the subsequent mental rehearsal of that plan) during the microteaching course. Comments such as:

> "Planning the presentation is obviously very important. However, planning the presentation,

> writing a lesson plan, and practicing a lesson are not the same thing."

were typical. However, although planning remained a high priority during student teaching, there were no comments concerning the rehearsal or practicing of one's written plans. Furthermore, although the writing of objectives as the first step in planning was heavily emphasized by these preservice teachers during the microteaching course, the same individuals rarely mentioned the writing of objectives as part of the planning process during their student teaching experience. When objectives were mentioned, they were considered as one of the final steps in planning a lesson or unit. As student teachers, the subjects of this investigation consistently began the planning process by reviewing the subject matter to be taught and then immediately searching for analogies, demonstrations, metaphors, stories, or activities to "best" communicate the content. This search often resulted in some frustration as evidenced by comments such as:

> "I need to improve my collection of teaching tricks and stories."

> "I wish somebody had given me a collection of good demos and tricks to keep kids interested and make the content concrete."

> "I need more analogies at my fingertips."

These "pleas" for assistance bear a striking resemblance to the recently popularized construct of "pedagogical content knowledge" (Shulman, 1986). Regardless of how these "tricks of the trade" are defined, they were not a concern of this group of preservice teachers as they proceeded through the microteaching course. The most persistent problem recognized by the student teachers was the lack of time for proper planning, student learning, and coverage of required content. Comments such as:

> "I need to use my time more efficiently. I don't have enough time to do what I need to do."

> "Twenty-eight hours a day wouldn't be long enough for me to do a good job. There's not enough time to get ready."

clearly dominated the comments and concerns of the student teachers. This concern for time offers a possible explanation for the student teachers' altered view of planning. Perhaps, they perceived that there was too little time to write objectives and rehearse one's plans. Instead, time was better spent seeking those quick and easily implemented "tricks of the trade" which could convey subject matter and maintain student interest.

Clearly, the most significant finding of this investigation relates to the much publicized developmental shift in preservice teachers' concerns from self to students. Upon completion of the microteaching phase of

this investigation it had appeared that the preservice teachers had made such a shift in concerns. The following comments from microteaching are representative of the category Use of Questioning:

> "I 'fumbled' (for lack of a better word) on a couple of occasions because a student's response wasn't what I expected."

> "I've learned how important it is to try to anticipate students' comments so you're not completely caught off guard and floundering."

> "One significant thing I've learned, thus far, is that you cannot expect that the students will answer the way you want. The teacher needs to be ready to react to all kinds of circumstances."

Although in each of these remarks there is a focus upon students, it would be incorrect to conclude that the teacher has shifted his/her focus of concern from self to student. It is clear that the focus upon students in the previous quotations is related to how students can cause a teacher's presentation to "flounder" or how unanticipated student questions can upset the flow of the lesson. Rather than the focus being on student learning, the focus is an egocentric one with respect to the teacher's ability to execute his/her plan and does not represent a shift in concerns from self to students. Interestingly, this same group of preservice teachers began student teaching with a clear focus on

student learning as opposed to the aforementioned "pseudo" focus on students. The following are representative comments from the initial weeks of student teaching within the same category of concern:

> "I am just now learning how to use 'choice' offerings and compare/contrast to help a student answer a question. It helps better than paraphrasing because the kids stay tuned in better and they act as a guide better."

> "My individual questioning of students has been very well. A student will raise his/her hand with a problem and through a series of questions by me the student will work through the problem instead of being told the answer."

> "I'm learning to break questions down into smaller pieces, using more students to answer, then rephrasing the question as a statement."

Although these preservice teachers proceeded directly from the microteaching course into student teaching, there appears to have been a clear shift in concerns. Perhaps, the audience of peers during microteaching presentations are not viewed as "real" students and so no sincere concerns for students can develop. Alternatively, the overwhelming presence of "real" students within the context of student teaching compels the preservice teacher to immediately and necessarily shift his/her concerns from self to students.

Implications for Science Teacher Education

Although the microteaching course is a basic component of virtually all science teacher preparation programs, its relevancy to the student teaching experience has never been investigated. In particular, this longitudinal investigation has shown that each of the concerns, perceptions, etc. (with the exception of Audio-Visual Use) exhibited by preservice teachers during a microteaching course persisted throughout student teaching. Although five additional areas of concern surfaced during actual field experience, this is not surprising when one considers some of the inherent differences between microteaching presentations and those made in actual classrooms with "real" students. In short, the microteaching course appears to be an excellent campus based prelude to the student teaching field experience.

It is a common perception that preservice teachers proceed through a developmental process of "Concerns for Self" to "Concerns for Students" (Cronin, 1988; Fuller, 1969). However, the "sudden" shift in concerns exhibited by the subjects of this investigation raises some interesting questions. That is, these preservice teachers appeared to shift their concerns during the brief period between the microteaching course and student teaching. At this time, there was no formal intervention or influence known to be affecting the subjects. Perhaps, each preservice teacher's reflections and anticipations caused the noted change.

However, the inherent limitations of a campus based microteaching course as a simulation for an actual field based situation are a more likely explanation. In a microteaching course an individual is asked to present lessons to a small group (e.g., 8-10) of peers. Irrespective of any role playing which may occur, it is quite doubtful that the "teacher" can forget that he/she is instructing college students who are most likely already familiar with the subject matter of the lesson. In addition, the microteaching situation really provides for no internalized teacher accountability with respect to student learning or behavior. Consequently, when a member of the microteaching audience asks for assistance, the "teacher" may not view the "student's" confusion as real (or at least not in the same manner as he/she would view an adolescent's confusion) and the attempt to clarify any misconceptions would tend to be more mechanical responses than actual attempts to enhance learning. After all, the preservice teacher's peers really do understand the material and the "teacher" is basically being graded upon the appropriateness of his/her response to the "apparent" confusion. In a "real" classroom, the presence of students and their needs immediately impinges upon the student teacher and he/she can not help but adjust the direction of concern from self to student. The inherent limitations of the microteaching course does not negate its effectiveness in teacher education, but it should cause those involved in science

teacher preparation to readjust their expectations of preservice teachers prior to student teaching. Can a preservice teacher have "real" concerns for students prior to being in a situation which actually contains "real" students? On a more theoretical note, the apparent developmental shift in concerns from self to students is very possibly an artifact of the inherent differences between a campus based teaching situation and a field based teaching situation as opposed to actual professional development. Clearly, it is time to reevaluate this long lived developmental view of teachers' concerns.

Finally, the enormous work load and time constraints were a continuing concern during student teaching while neither was mentioned as a concern during the microteaching course. In addition, instructional planning during student teaching virtually ignored any concern for objectives and the heavily emphasized "rehearsal" aspect of planning elucidated during microteaching. Instead, student teachers were primarily concerned with finding those easily implemented "teaching tricks" or "neat" demonstrations which effectively convey subject matter and maintain student attention. On a positive note, these student teachers may have been appropriately concerned with the effective teaching of subject matter and student motivation. But, what subject matter? And, at what cost? These individuals did not concern themselves with objectives or careful reflection upon what they had planned. The tension among

time constraints, instructional planning, and "coverage" of subject matter is a well recognized concern of the most experienced teachers and there is little hope for any immediate relief. The realities of student teaching are difficult to anticipate and the experience is often analogous to "throwing" the preservice teacher "into the deep end of the pool." However, the rather sudden "immersion" of the student teacher into such a situation may create more poor habits, in the form of survival skills, than effective instructional skills and strategies. The transition to becoming a classroom teacher may be better served by making the initial responsibilities minimal (e.g., one class) and the subsequent addition of responsibilities (e.g., adding single classes on a three week time frame up to a maximum of three) more gradual. Taking such an approach to the student teaching experience would provide the preservice science teacher with a more realistic opportunity to develop skills in careful planning and reflection in a field based situation. The result can only be a more efficient science teacher and the improvement of science instruction.

Metamorphosis, adaptation, or evolution: which is the most accurate way to view the professional development of the science teacher? As with many life forms, all three provide significant contributions. The preservice teachers in this investigation exhibited a transformation in concerns during the apparent latent period between microteaching and

student teaching, a type of metamorphosis. Upon immersion into the actual classroom setting, new problems (e.g., work load, time constraints, student abilities, etc.) confronted the student teachers as evidenced by the increased quantity of stated concerns. These increased concerns were accompanied by the noted differences in behavior (e.g., approaches to planning) in an effort to "survive" the classroom situation, a type of behavioral adaptation. Evolution (with natural selection as its primary agent) is, perhaps, the most significant vexation of science teacher educators. That is, despite our best efforts, science teachers often survive or "die" as a function of the school or classroom setting into which they have been placed. On the other hand, our recognition of the diversity of school and classroom environments has prevented us from educating all of our teachers to follow the same set of behaviors and procedures as a formula for success. Educating science teachers in a repertoire of skills and promoting reflective decision making clearly recognizes the selective power of the diverse classroom environment and insures the diversity and, therefore, survival of the species, Magister schola.

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